



# State of Energy Markets

January 1, 2002–June 30, 2003:  
Staff Report to the Commission



January 22, 2004

Office of Market Oversight and Investigations  
Federal Energy Regulatory Commission

## **Objective of the report**

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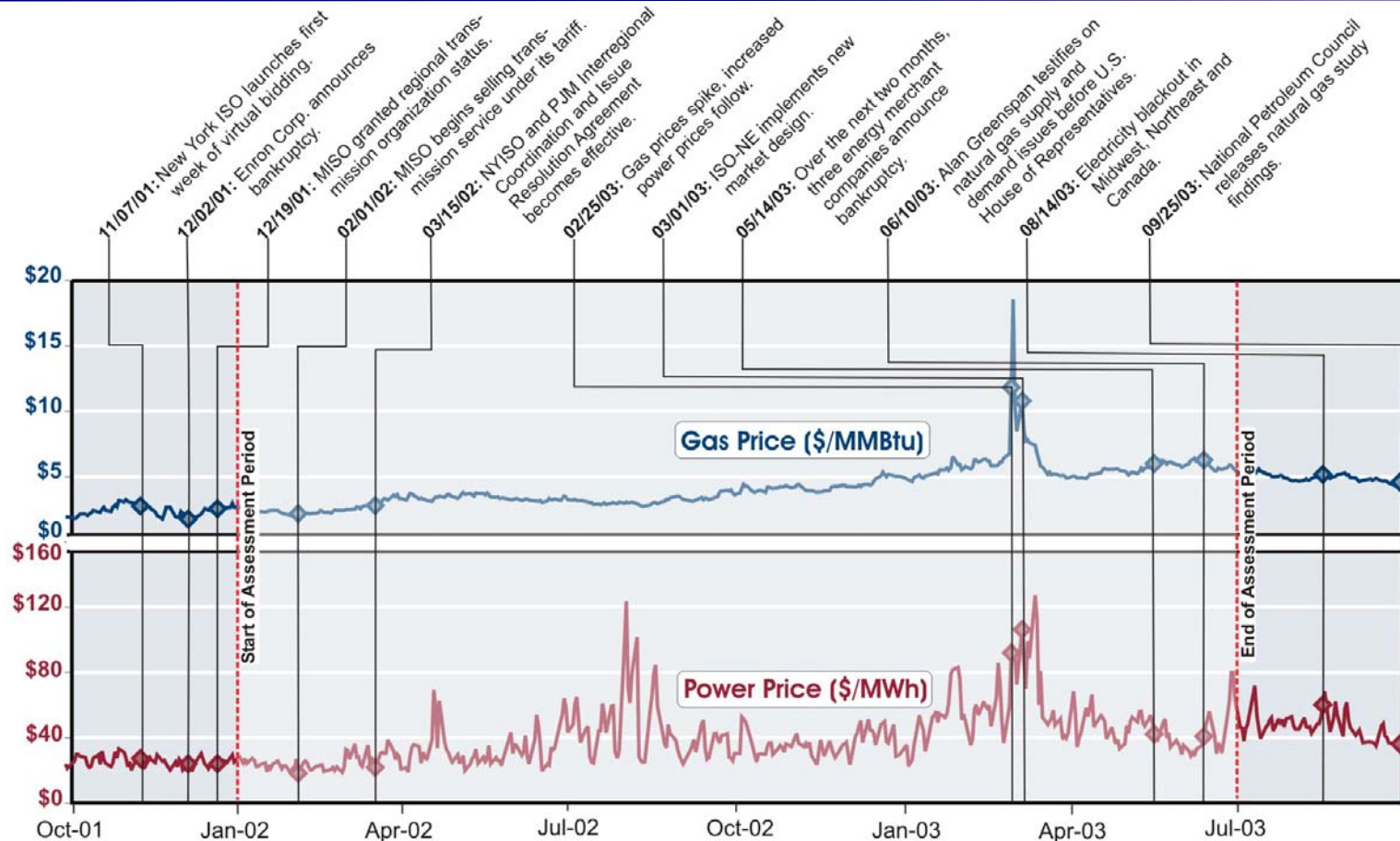
Assess the performance of energy markets during the period January 1, 2002–June 30, 2003 against measurable characteristics of a well-functioning competitive market.

## **Energy markets managed serious challenges and made marginal improvements**

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- Market liquidity declined as a result of deterioration of financial conditions and credit-worthiness.
- There was a corresponding decline in use of risk management tools.
- The transparency and reliability of energy price formation was challenged.
- Mixed incentives for energy investment.
- Increasing interdependence between natural gas and electricity market operations and prices.

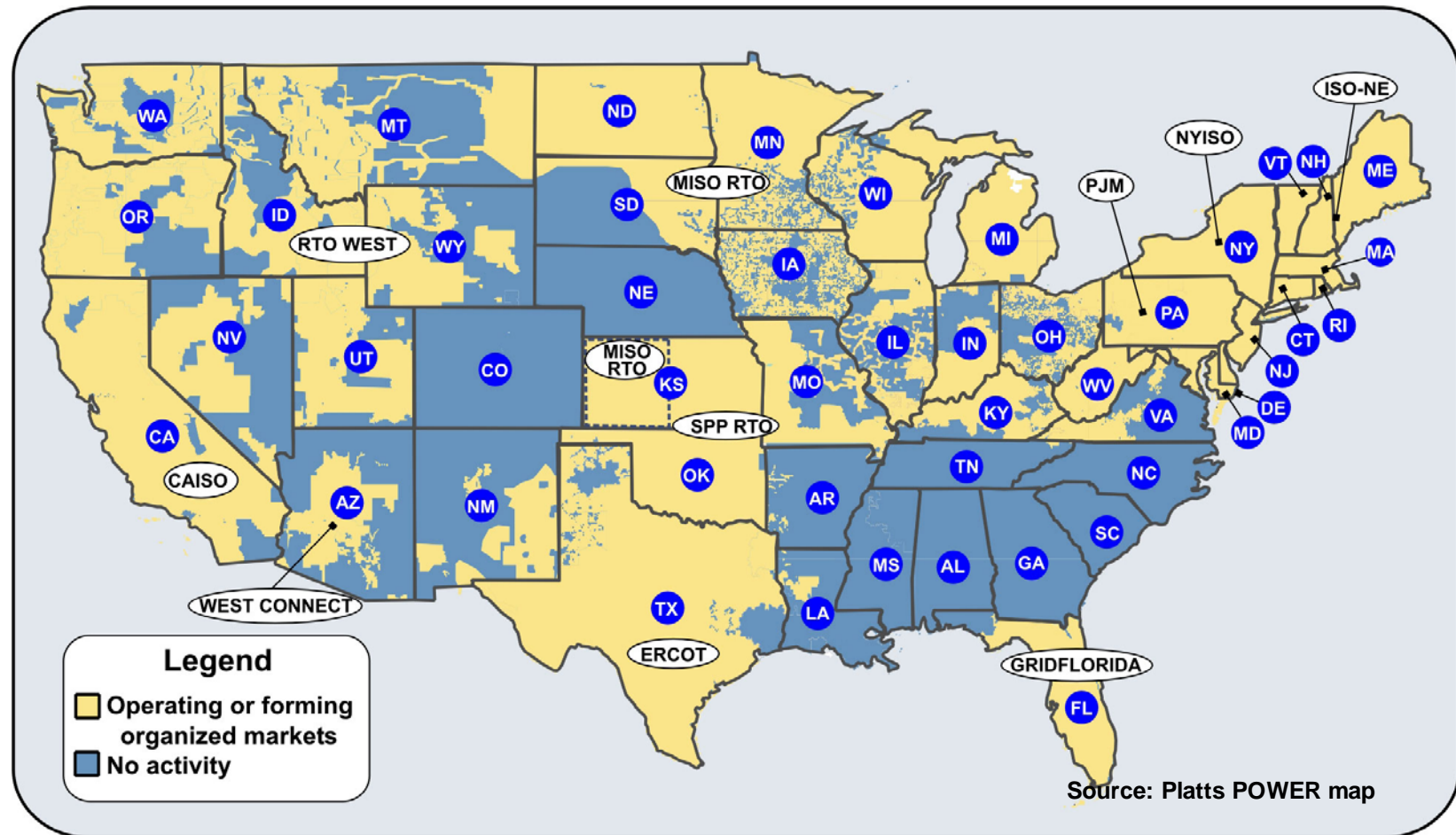
# Market events seriously challenged market liquidity and credibility during the report period



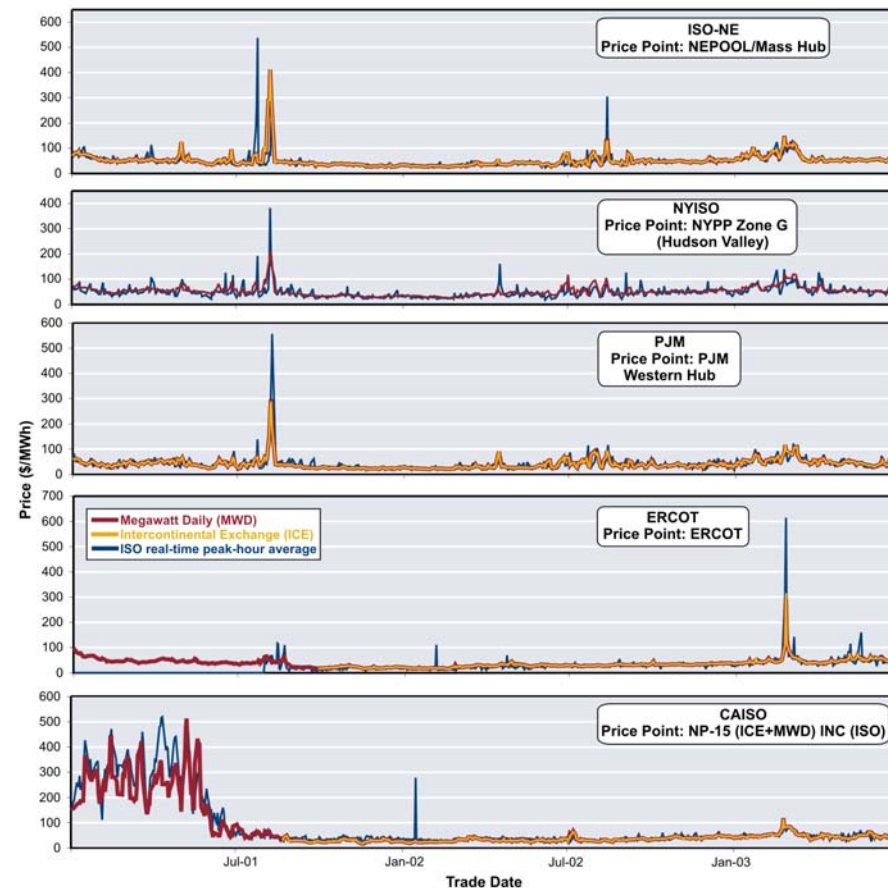
Note: Gas *Daily* spot prices at Henry Hub provided to illustrate two years of U.S. gas commodity price behavior starting in winter 2001/02. An average of peak hour prices in PJM's day-ahead market provided as an example of regional power prices.  
Source: PJM, Platts *Gas Daily* and trade press

**Electricity: Solid performance  
despite tough market challenges**

**Organized electricity markets, operating and forming, served 67 percent of the U.S. population during the assessment period**



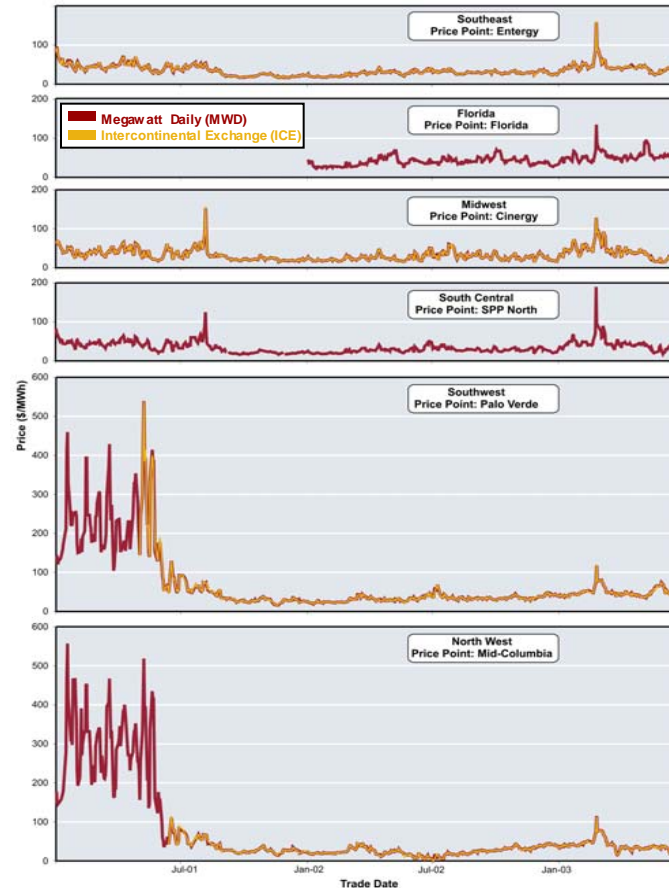
# Organized markets delivered electricity to customers at average regional prices lower than in 2001



Notes: *Megawatt Daily* and ICE data are volume-weighted day-ahead peak prices. ISO data are averages of real-time hourly prices during peak hours. NYPP Zone G (Hudson Valley) contracts do not have an active market on ICE. Source: Platts *Megawatt Daily*, ICE, ISO-NE, NYISO, PJM, ERCOT and CAISO.



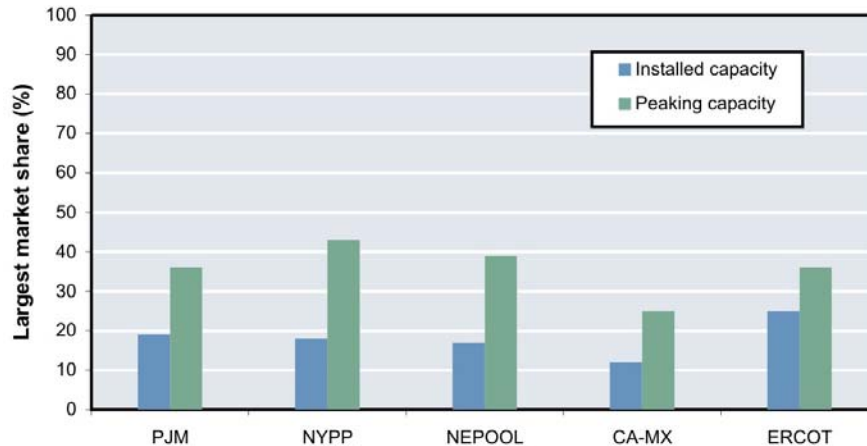
**Bilateral prices outside regions with organized markets reported lower-than-2001 levels, trending upward in summer 2002 and during the February/March 2003 natural gas price spike**



Notes: Florida and SPP North do not have an active market on ICE. Source: Platts *Megawatt Daily* and ICE

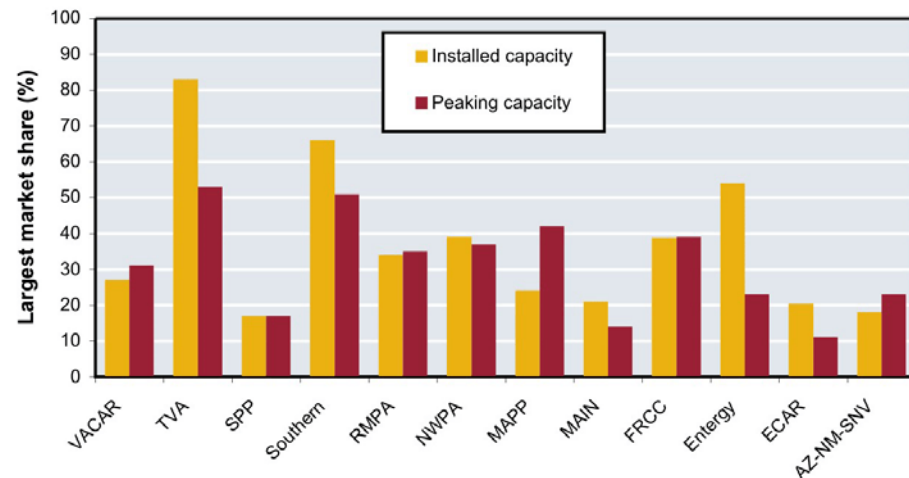


# Generation ownership concentration was low in regions with organized markets and higher in those without



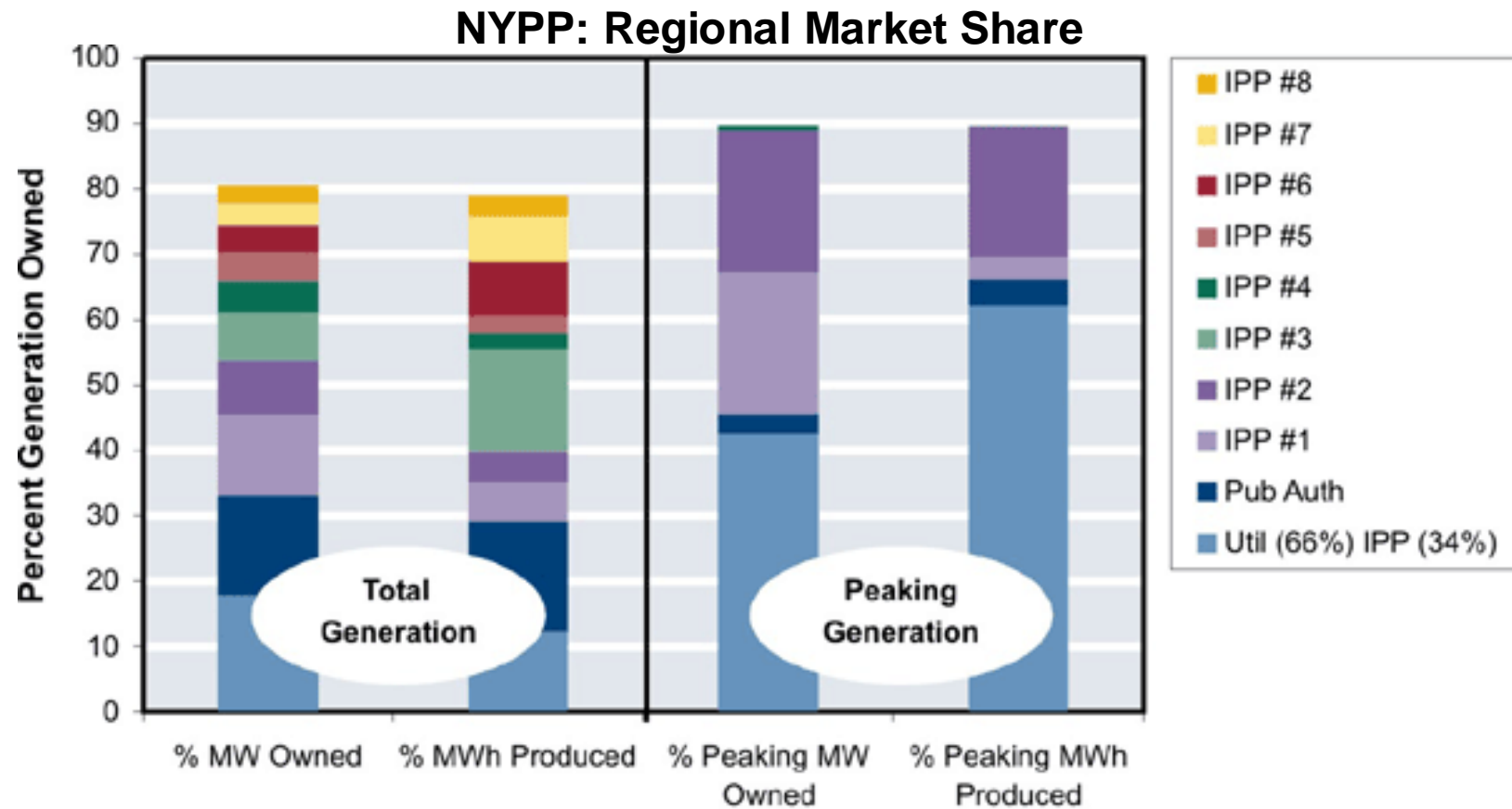
Regions with organized markets

Regions without organized markets



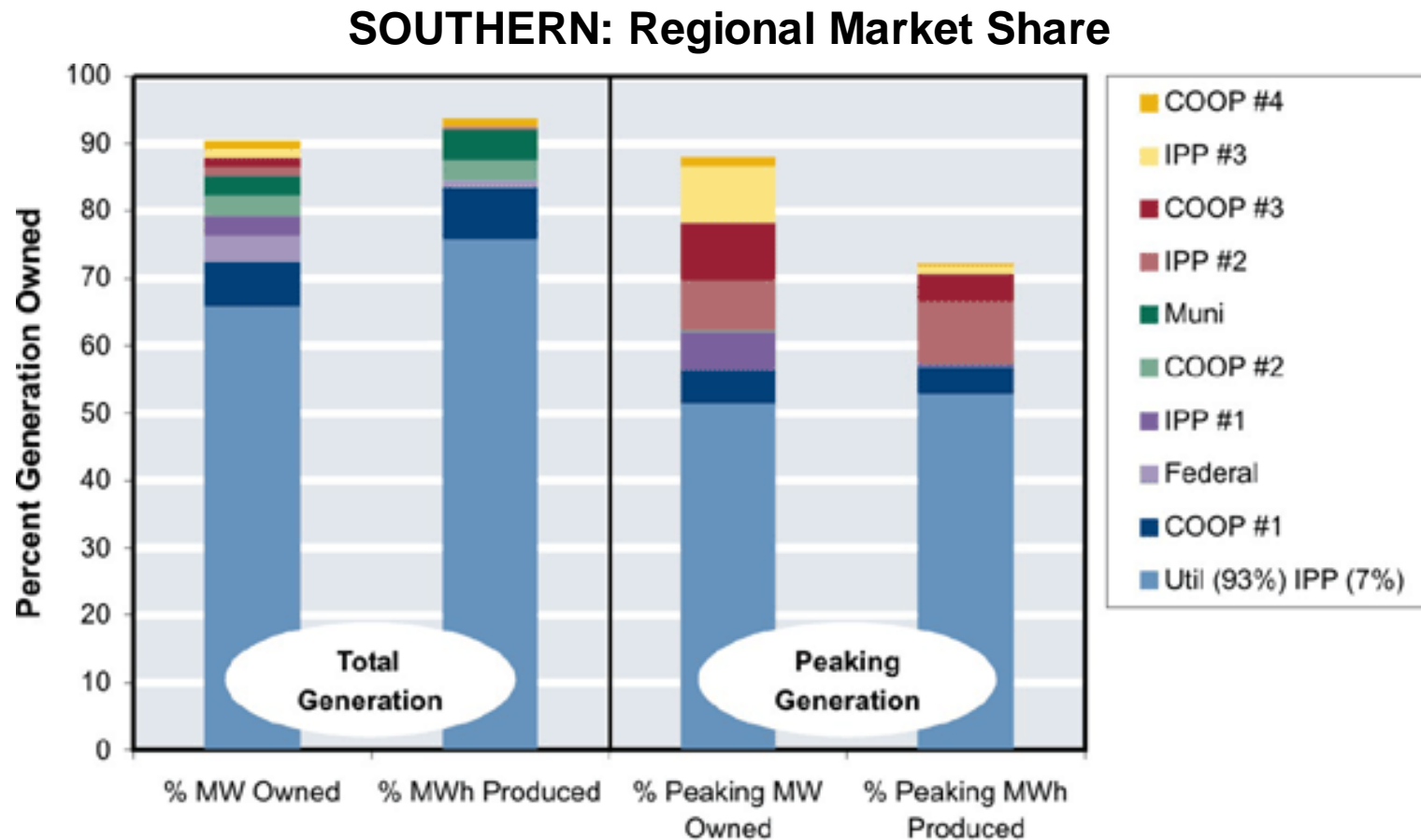
Source: Platts POWERdat, Modeled Production Costs-Ownership-Based dataset for calendar year 2002.

# High generation ownership concentration characterized some load pockets in organized markets



Source: Platts POWERdat, Modeled Production Costs-Ownership-Based dataset for calendar year 2002.

# High generation ownership concentration characterized the Southern subregion of SERC



Source: Platts POWERdat, Modeled Production Costs-Ownership-Based dataset for calendar year 2002.

# Customers had superior market options in organized markets

	■ = Yes ● = No	Bilateral contracts price index	Real-time exchange	Day-ahead exchange	Ancillary services markets	Capacity market	Active physical day-ahead ICE market	Futures market	Financial Transmission rights	Virtual bidding
ISO-NE		■	■*	■*	■*	■* (2)	■	●	■*	■*
NYISO		■	■*	■*	■*	■* (2)	●	●	■*	■*
PJM		■	■*	■*	■*	■* (2)	■	■	■*	■*
Southeast		■	●	●	● (1)	●	■ Entergy only	●	●	●
Florida		■	●	●	● (1)	●	●	●	●	●
Midwest		■	●	●	● (1)	●	■	●	●	●
South Central		■	●	●	● (1)	●	●	●	●	●
ERCOT		■	■*	●	■*	●	■	●	■*	●
Southwest		■	●	●	● (1)	●	■	●	●	●
Northwest		■	●	●	● (1)	●	■	●	●	●
CAISO		■	■*	●	■*	●	■	●	■*	●

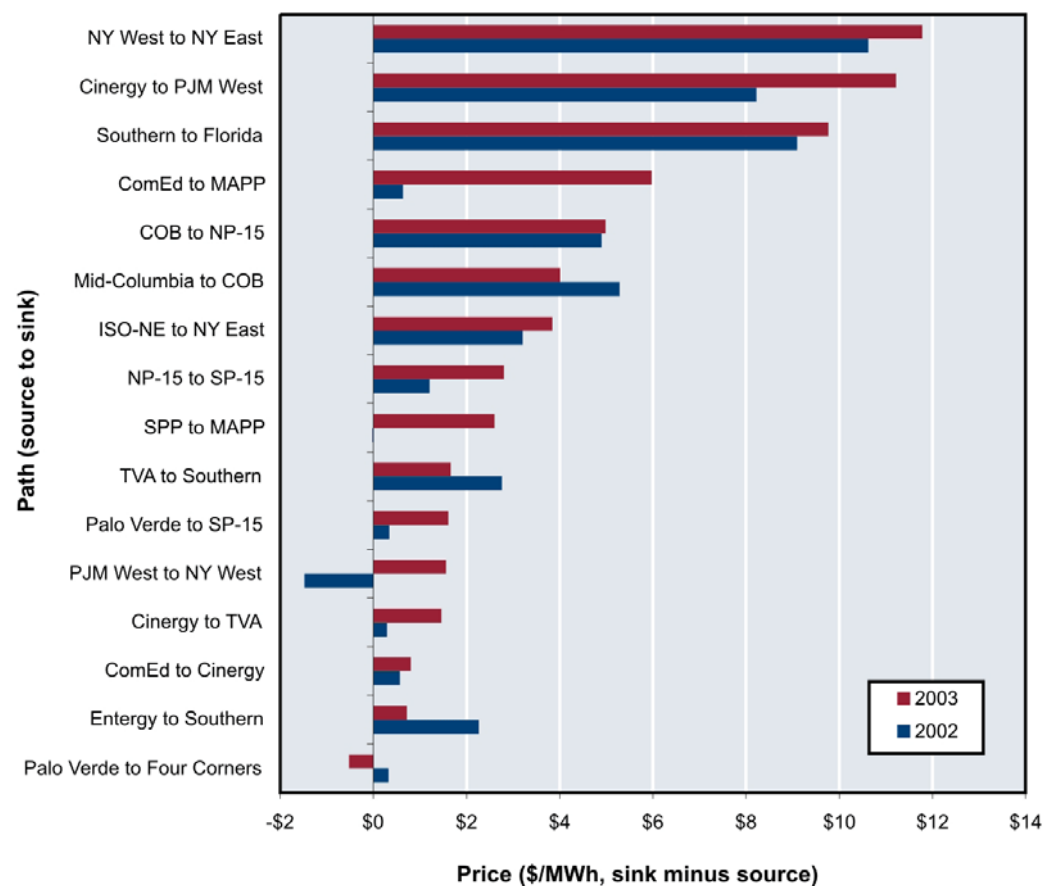
Notes: \*Designates a market operated by an ISO. (1) Ancillary services are provided at cost-based tariff rates or negotiated bilaterally. (2) ISO conducts an auction-based capacity market. Bilateral contracts and self-supply are also allowed. Source: OMOI

# Price formation was less transparent in regions without organized markets

Legend: ■ = Yes ● = No	Regions with organized markets					Regions without organized markets					
	ISO-NE	NYISO	PJM	ERCOT	CAISO	South-east	Florida	Midwest	South Central	South-west	North-west
Services Provided											
Real-Time Energy Market	■	■	■	■	■	●	●	●	●	●	●
Locational Energy Price	■	■	■	■	■	●	●	●	●	●	●
Hourly Energy Price	■	■	■	■	■	●	●	●	●	●	●
Congestion Price	■	■	■	■	■	●	●	●	●	●	●
Losses Price	■	■	● (1)	■	■ (2)	●	●	●	●	●	●
Regional:											
Transmission Scheduling	■	■	■	■	■	●	●	■	●	●	●
Economic Dispatch	■	■	■	■ (3)	■ (3)	●	●	●	●	●	●
Transmission Planning	■	■	■	■	■	●	●	■	●	●	●
Interconnection Process	■	■	■	■	■	●	●	■	●	●	●
Independent Market Monitor	■	■	■	■	■	●	●	■	●	●	●

Note: (1) Losses are allocated to market participants based on a pro-rata share of total transmission losses. (2) Losses are allocated to sellers using generation meter multipliers, which reflect scaled marginal losses. (3) CAISO and ERCOT do not have day-ahead markets; economic dispatch is used in their real-time balancing markets only. Source: OMOI

# Operational “seams” erect barriers to efficient trading between regions



Interregional price differences vary widely across the United States. Note: Annual comparisons based on January–September months only. Source: Platts *Megawatt Daily*

## Price differences can exist between regions due to differences in products, pricing and market rules between regions

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New England-New York price differences narrow when there is no congestion, but remain significant.

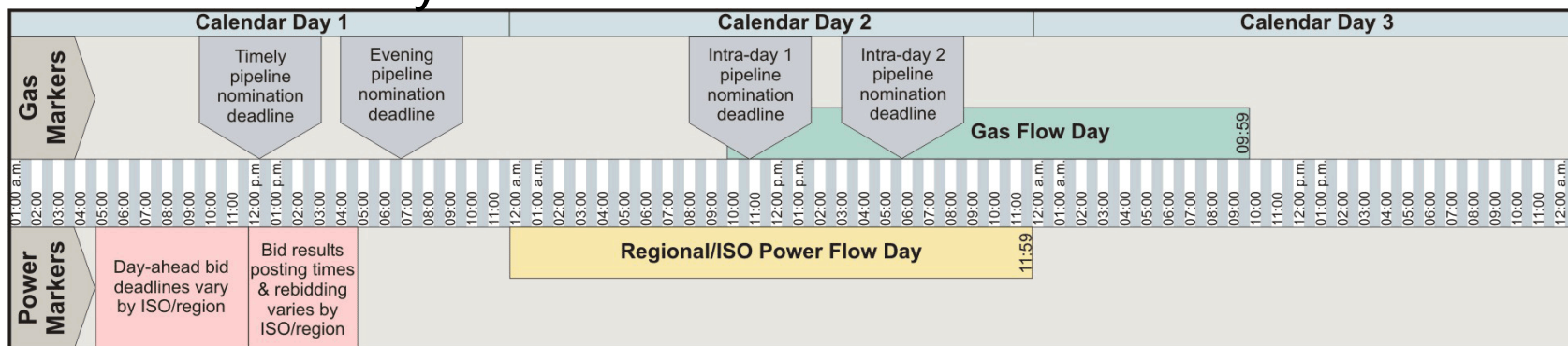


Note: Average price difference between New York and New England, uncongested hours. Source: *Virtual Regional Dispatch: Concept, Evaluation, and Proposal*, Joint Working Paper, ISO New England, Inc. and New York ISO, Inc., Appendix D, p. 20.



# Operational “seams” erect barriers to efficient trading between electricity and natural gas industries

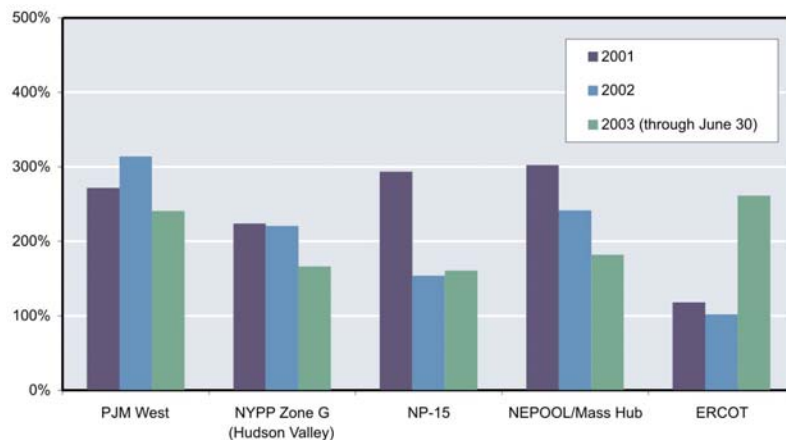
- Operational timelines for scheduling gas and bidding for power vary.
- Although uniform minimum standards exist for gas market participants’ nomination of and scheduling of gas on interstate pipelines, similar standards related to bidding and scheduling power do not exist in electricity markets.
- Inter-industry seams increase transactional costs.



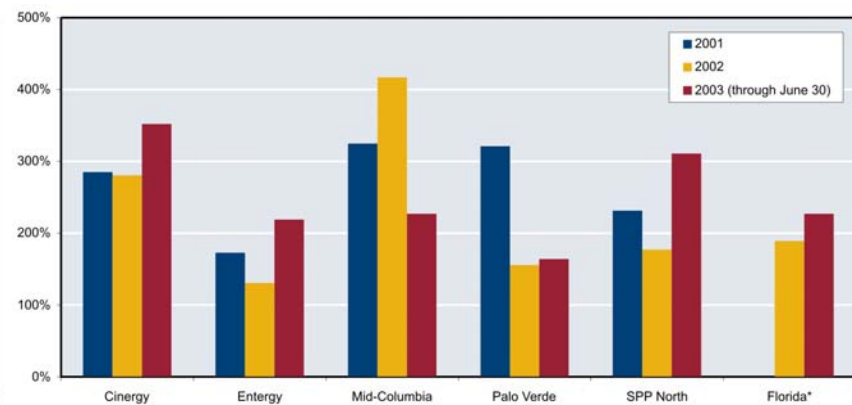
Notes: All times are Eastern Standard Time. Source: Based on tariff terms and conditions for FERC-regulated gas pipeline tariffs and ISO/RTOs.

# Electricity price volatility generally declined in regions with organized markets, but generally increased in regions without organized markets

## Regions with organized markets

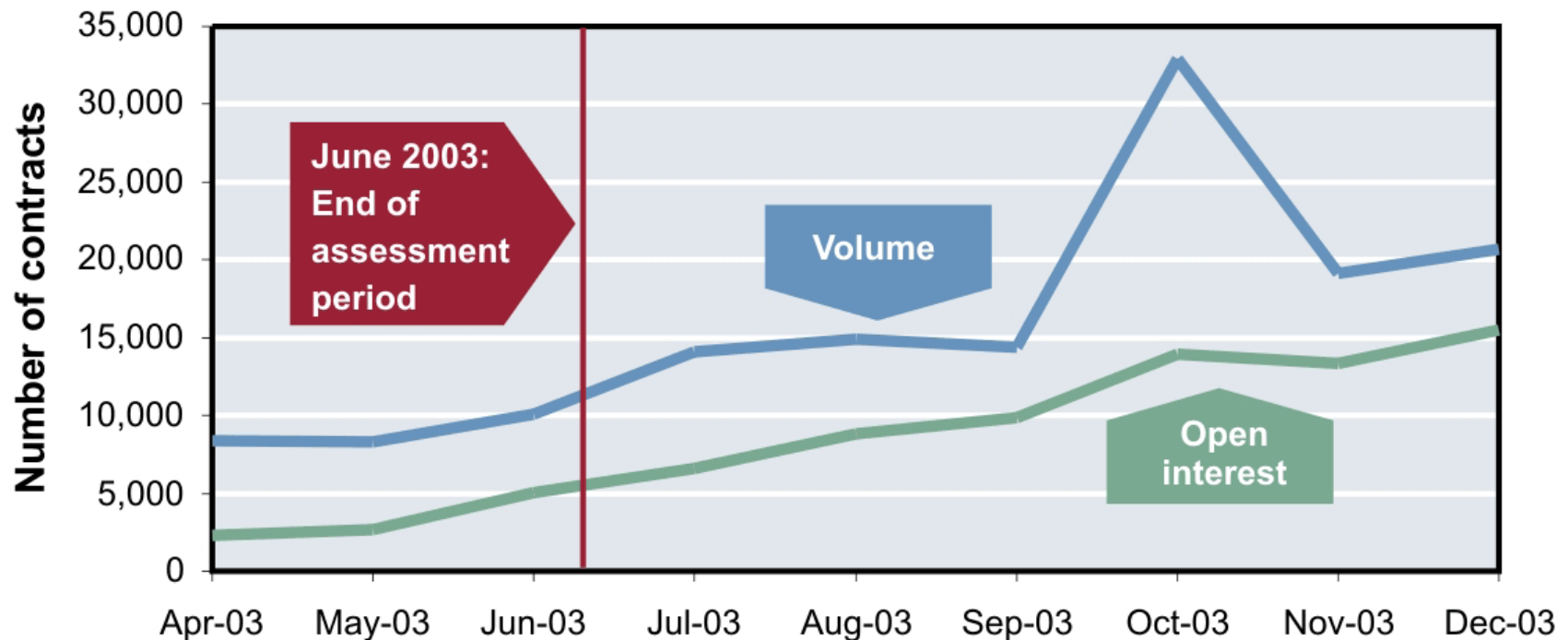


## Regions without organized markets



Note: Volatility calculation is based on all trading days during calendar year. \*Volatility calculations begin in 2002. Florida prices were intermittently reported prior to January 2002. Source: Platts *Megawatt Daily*.

# Introduction of the futures contract improved long-term price transparency in PJM



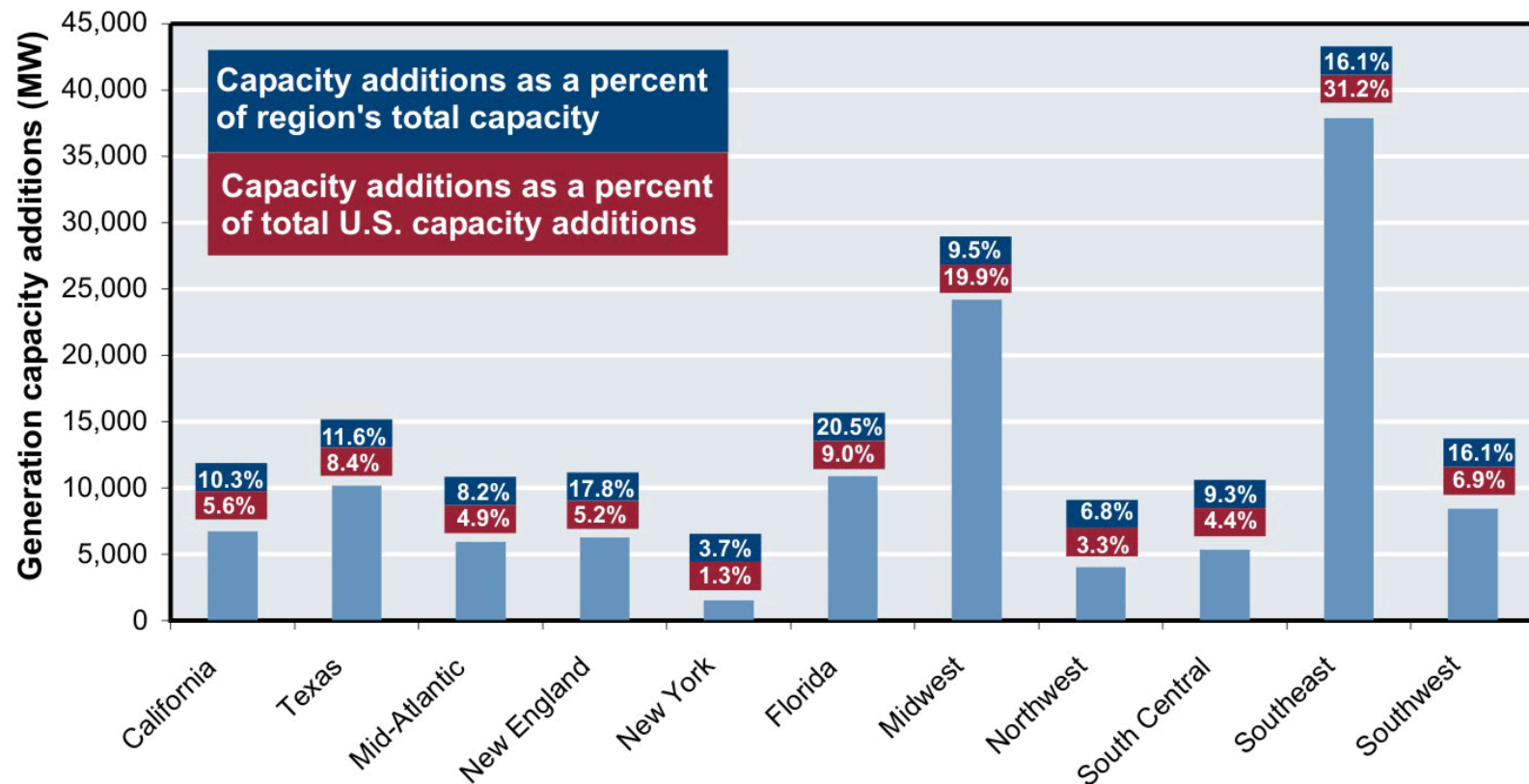
PJM Western Hub monthly electricity futures volume and open interest has grown since the introduction of the contract. Source: Nymex; CFTC, Commitment of Traders Report

## Usage of available electric risk management tools varied

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- Credit-worthiness affected usage of available forward products traded bilaterally.
- FTRs auctions were conducted in CAISO, ISO-NE, NYISO and PJM and were fully subscribed.
- FTR options were introduced in PJM in 2003 to supplement existing FTR obligations.

## Generating capacity additions completed during the assessment period were predominantly gas-fired and increased total U.S. capacity by 12 percent



New additions increased U.S. capacity by 12 percent. Source: Platts POWERdat, Utility Non-Utility Ownership dataset

## **Market incentives during the period for additional future investment were mixed**

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- Financial downturns for energy suppliers accompanied the emergence of concerns about the transparency and credibility of price formation.
- Reserve margin expansions, in conjunction with lower spark spreads and moderate weather patterns, led to declining energy and capacity prices during the assessment period.
- In contrast to prior construction cycles, investors in the newly constructed generation have primarily borne the risks of lower than expected revenues, rather than end-use customers.

## Despite market price signals that new resources were needed in load pockets, investment was limited

### Incentives to invest:

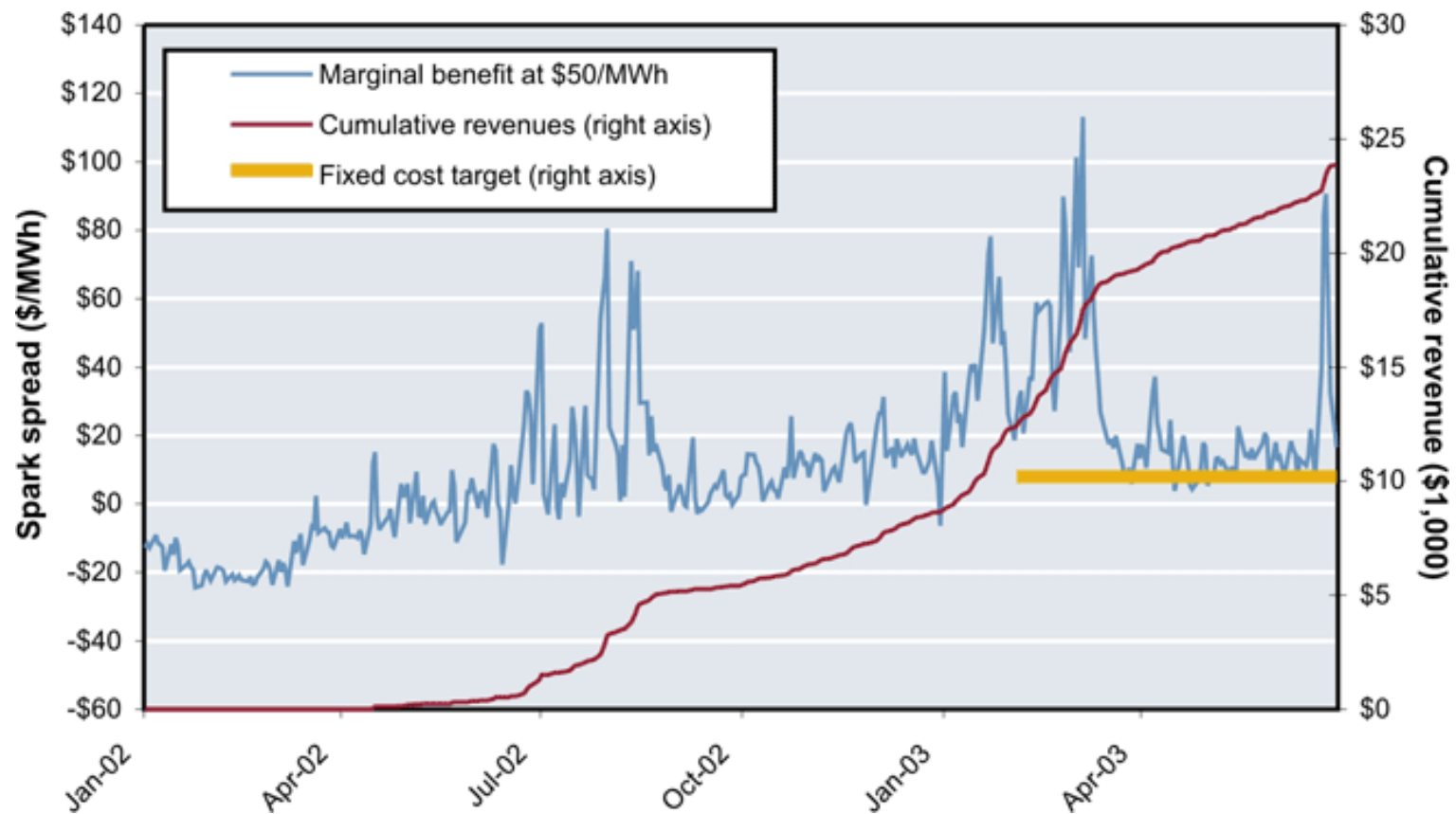
- Interconnection process
- Adequate transmission infrastructure
- Transmission availability (short-term dispatch)
- Locational energy pricing
- Locational capacity pricing
- Economic dispatch

### Impediments to invest:

- Siting and environmental permitting
- Limited site availability
- Fuel supply
- Regulatory—market design risk
- Mitigation
- Reserve margins
- Difficult financing markets and weak financial strength of merchants



## Lack of demand responsiveness to price harms competitive wholesale markets



Demand response would have been cost effective in some key locations including New York City (above), southwest Connecticut and the Delmarva Peninsula. Source: OMOI analysis, based on price data from NYISO and Platts *Gas Daily*.

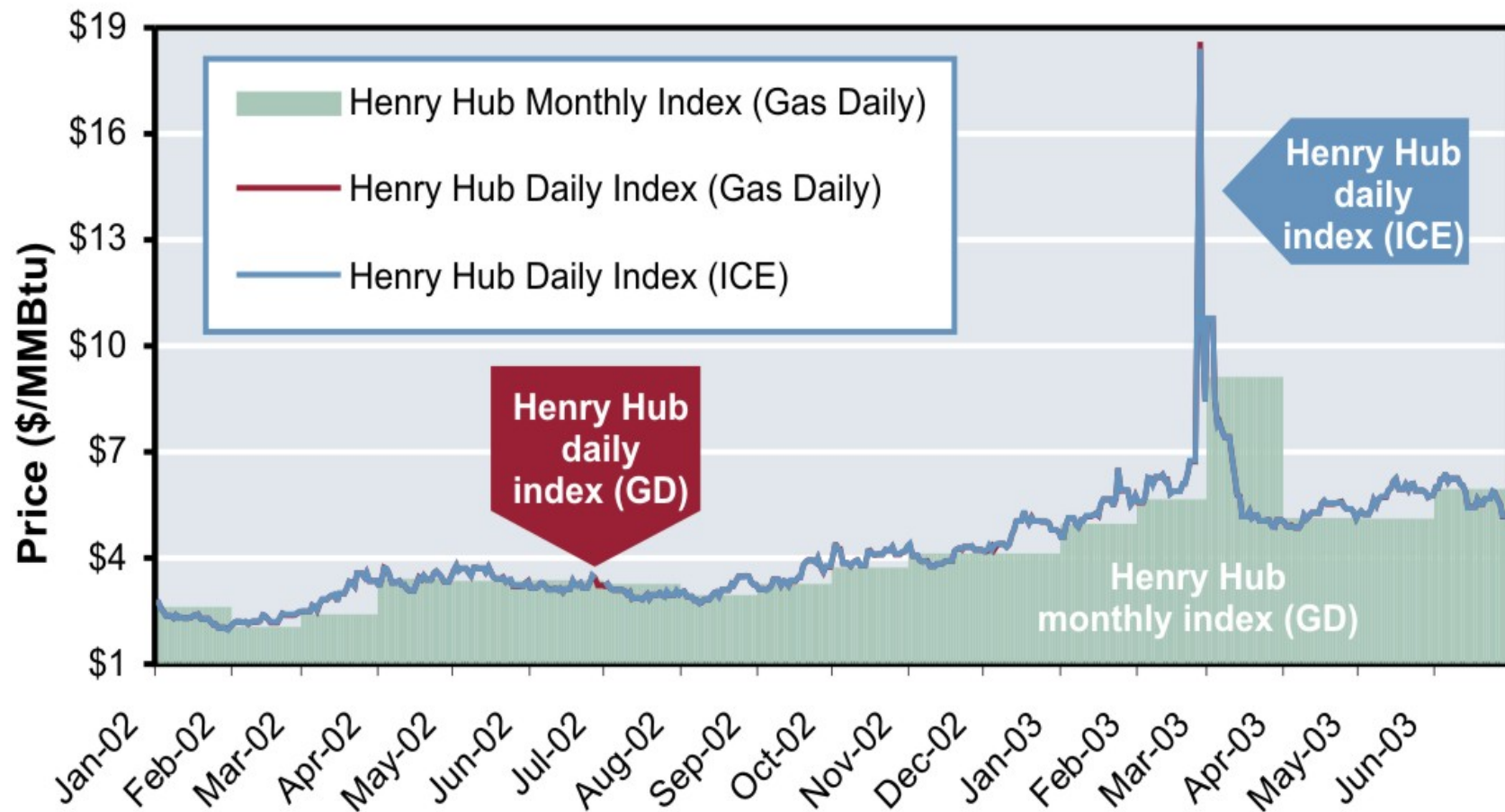
## **Market design and structure changes during the assessment period improved operations**

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- ISO-NE successfully introduced a day-ahead market.
- NYISO refined pricing and market rules and added a successful virtual transaction product.
- PJM successfully expanded to include APS, opened a spinning reserve market and improved the FTR auction process.
- Prices stabilized in California with the addition of 6,700 MW of new generation, improved hydro conditions and moderate demand compared to 2001
- A significant amount of new, efficient IPP generating capacity was installed in the Southeast but encountered difficulty reaching the market.

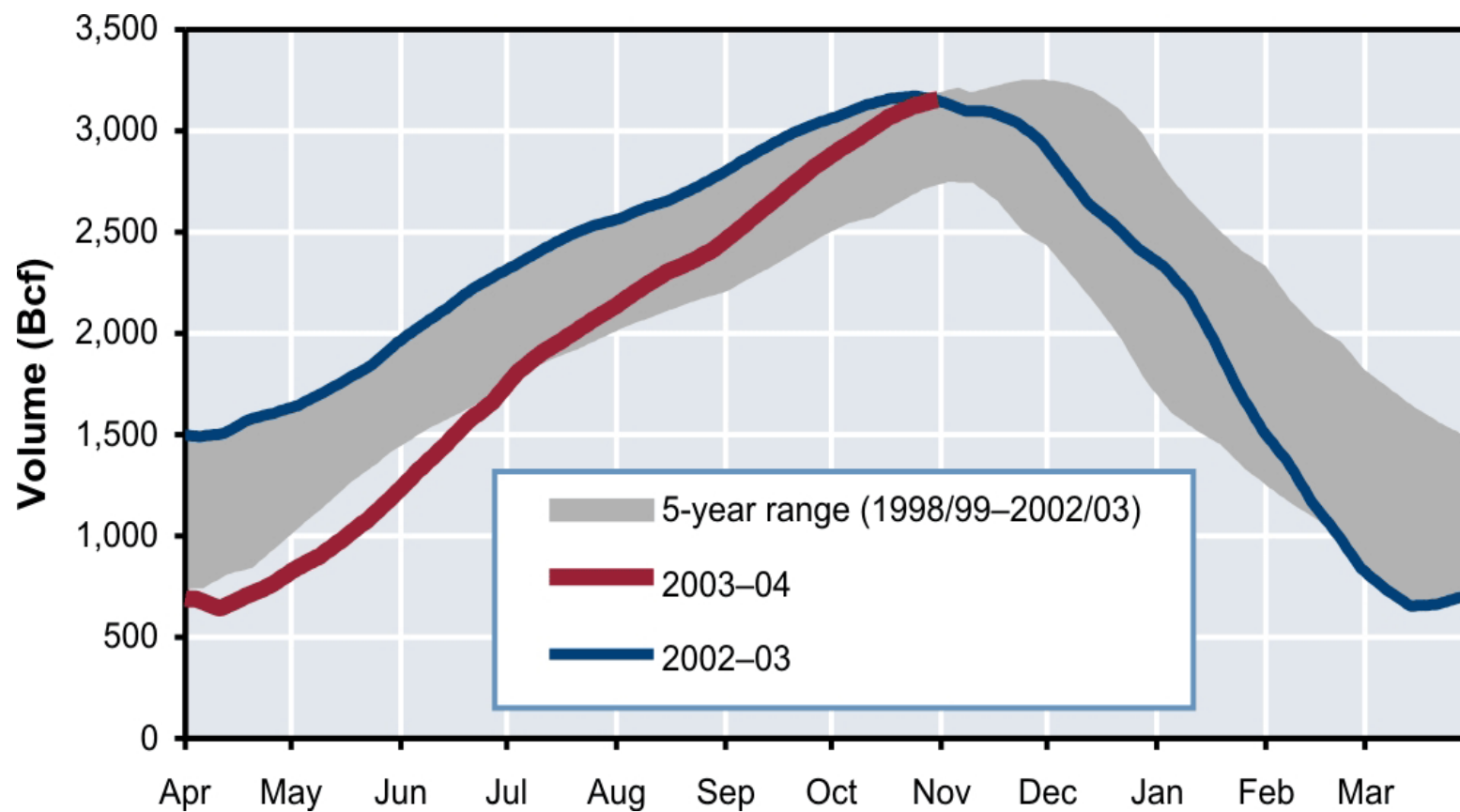
# **Natural Gas: Solid performance despite stress**

## Average natural gas spot prices increased



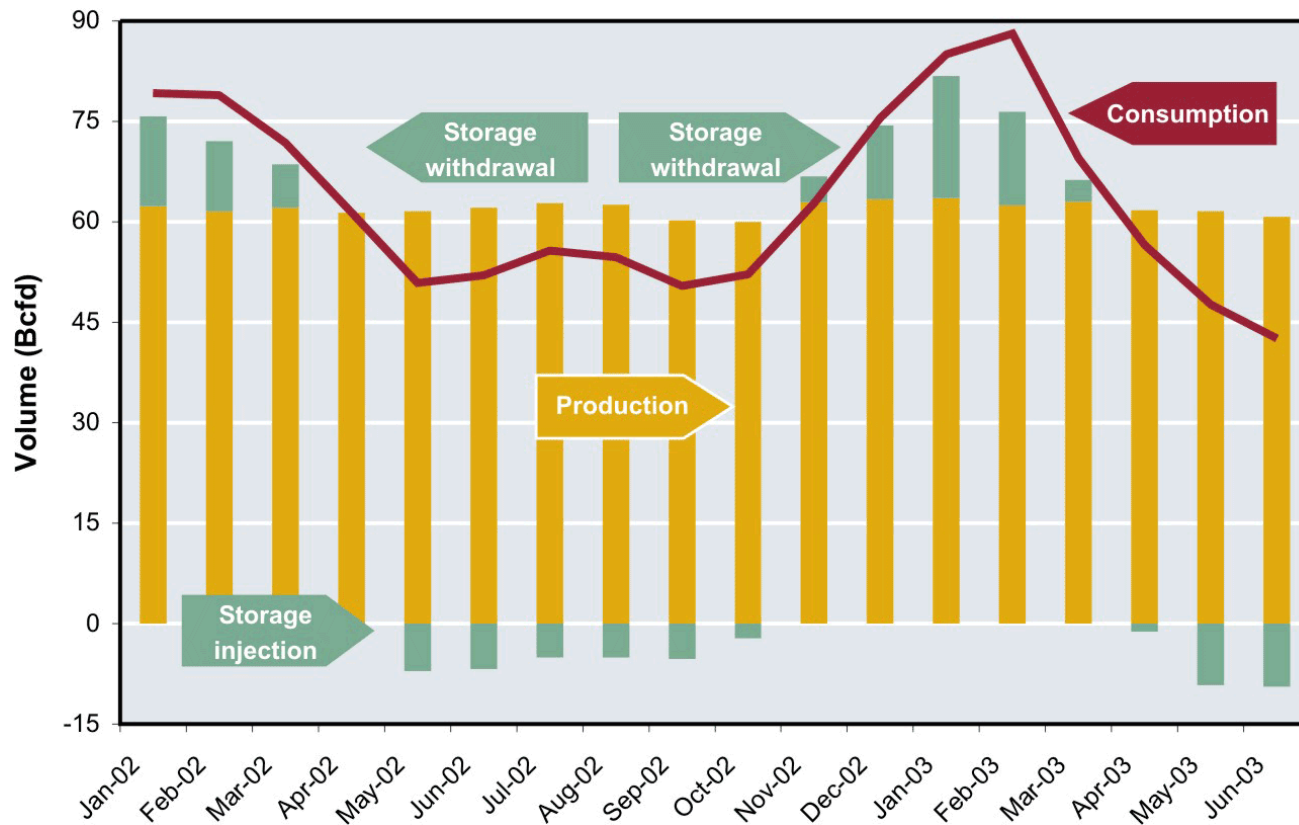
Source: Platts *Gas Daily* and ICE.

## Storage swings reflected tight supplies and contributed to higher prices



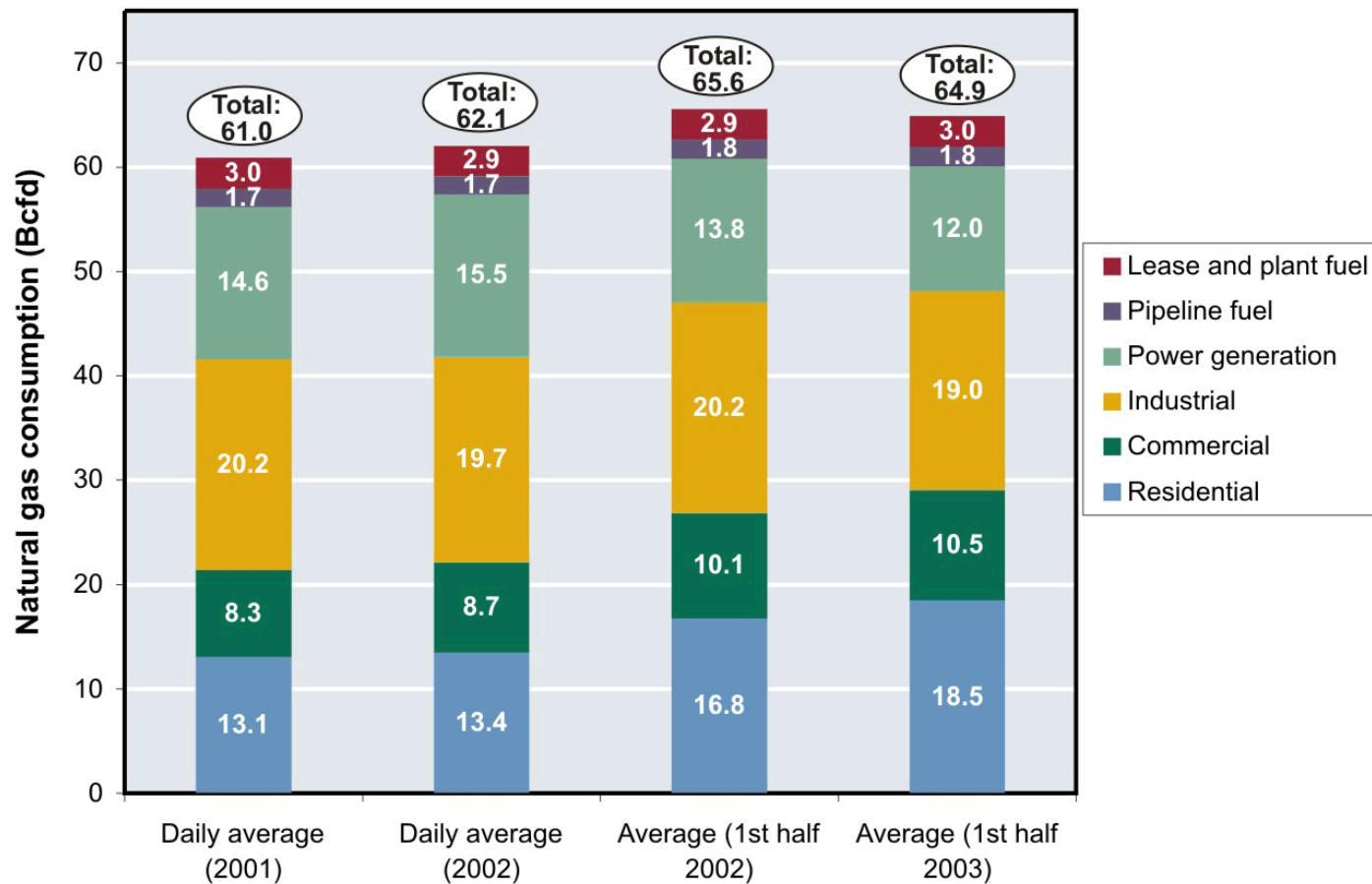
Source: EIA

## Gap in deliverability coincided with February/March 2003 price spike



Source: EIA consumption, storage, supply and import/export data from the EIA website; some supply data provided to EIA by the U.S. Mineral Management Service; import/export data are from the DOE's "Quarterly Natural Gas Import and Export Sales and Price Report."

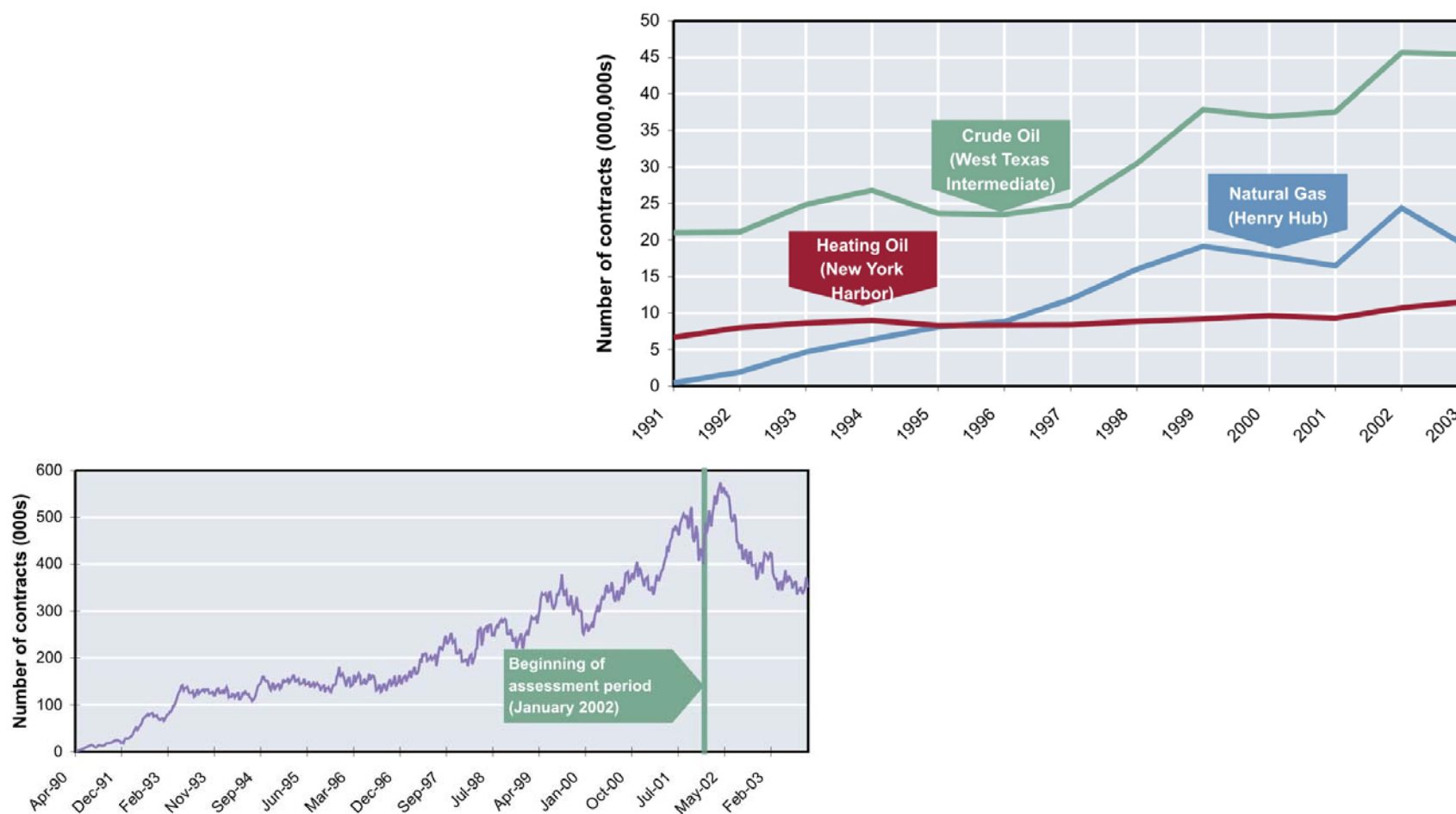
## Consumption shifted with higher prices



Note: Natural gas consumption by vehicles represents less than 1 percent and is not shown. Source: EIA data compiled from EIA forms 759, 857 and 895.



# Transactions to manage greater price volatility declined in face of credit crisis



Top figure: Source: Nymex. Bottom figure: Source: CFTC, Commitment of Traders Report.

## Credit crisis was partially offset by new participants and products

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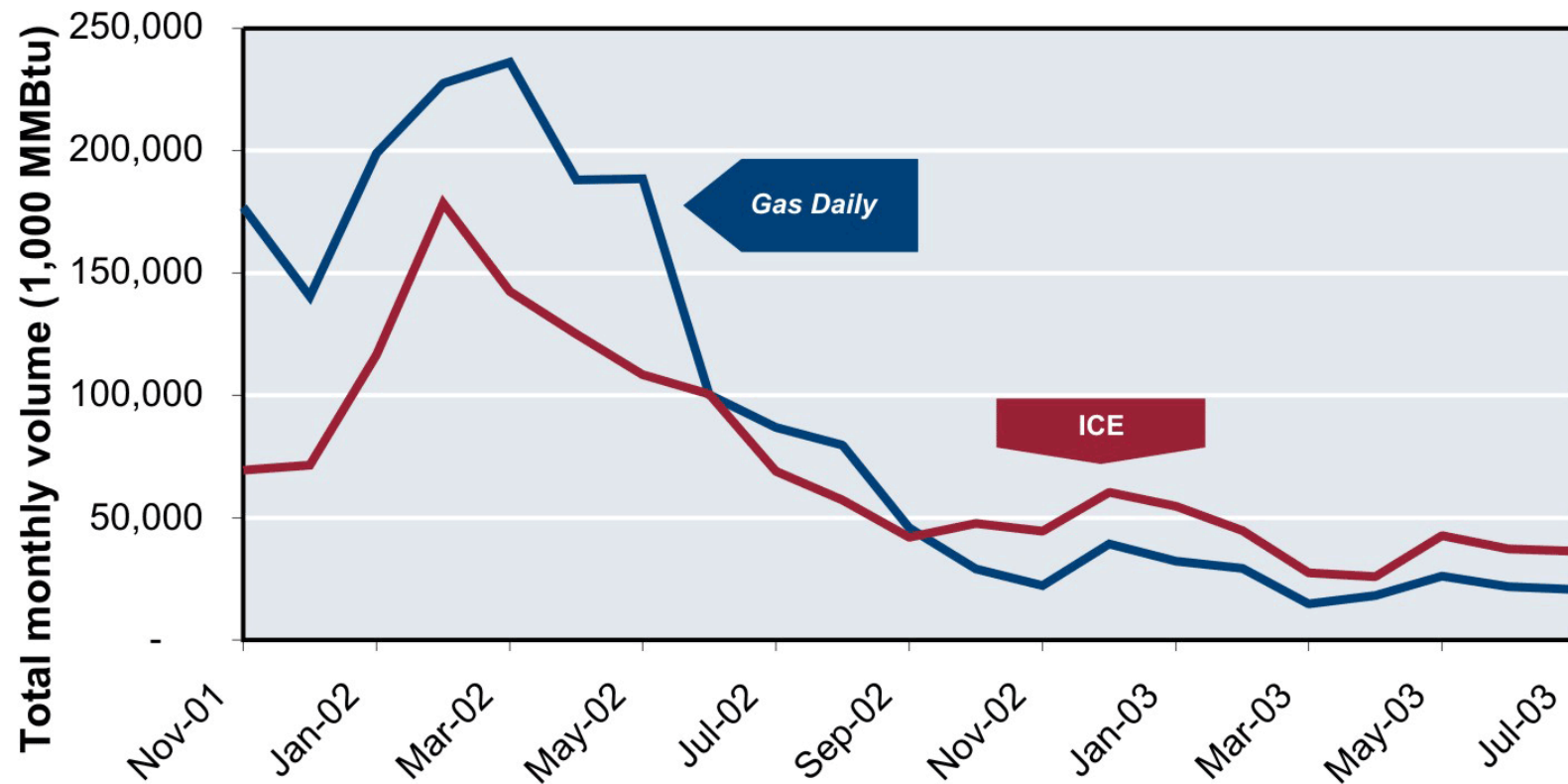
### New Participants

- Producers' marketing affiliates
- LDCs
- Financial firms (Goldman Sachs, Morgan-Stanley)
- Hedge funds

### New Products

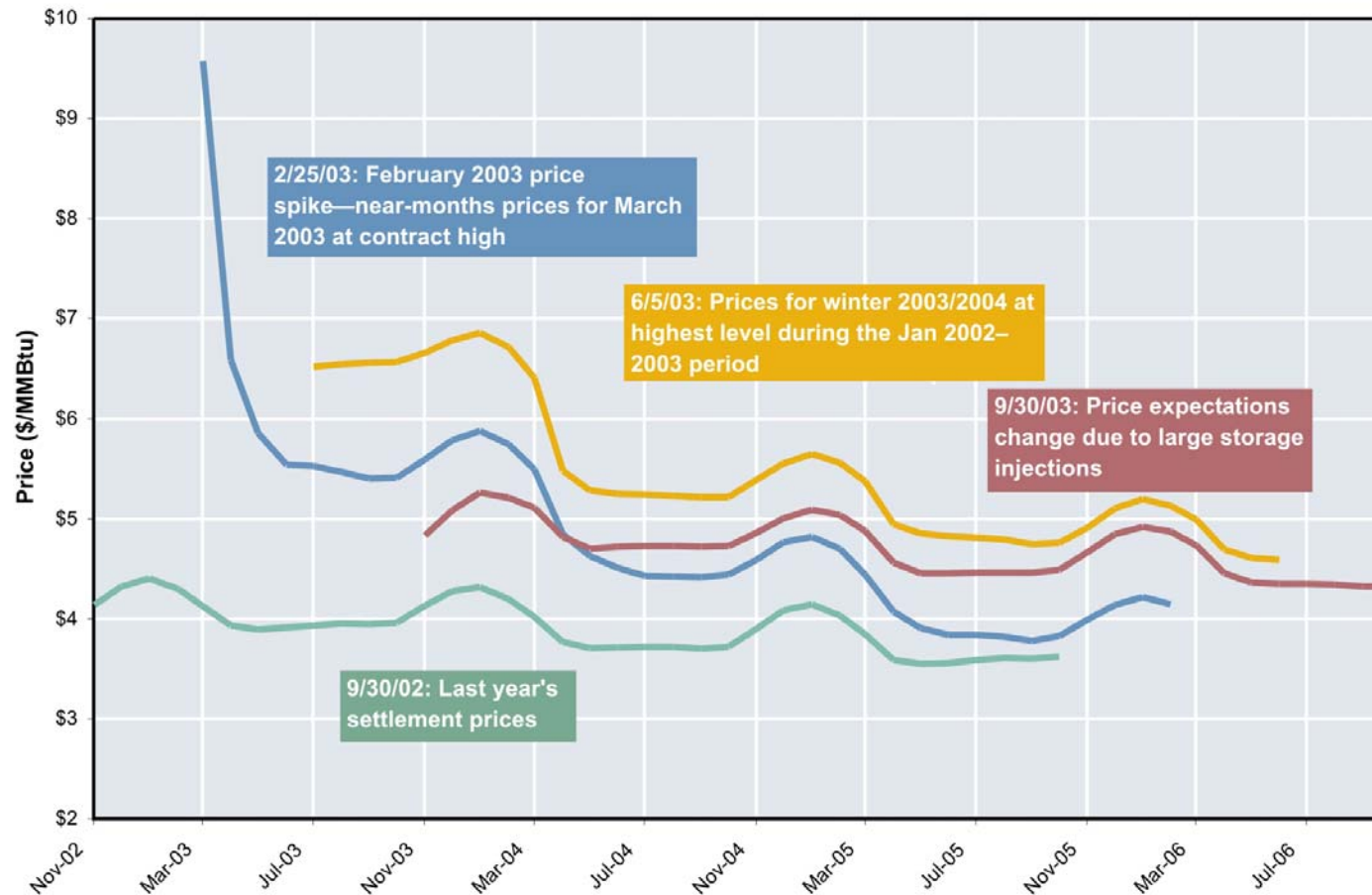
- Nymex and ICE credit clearing products

## The number of index-reported transactions deteriorated



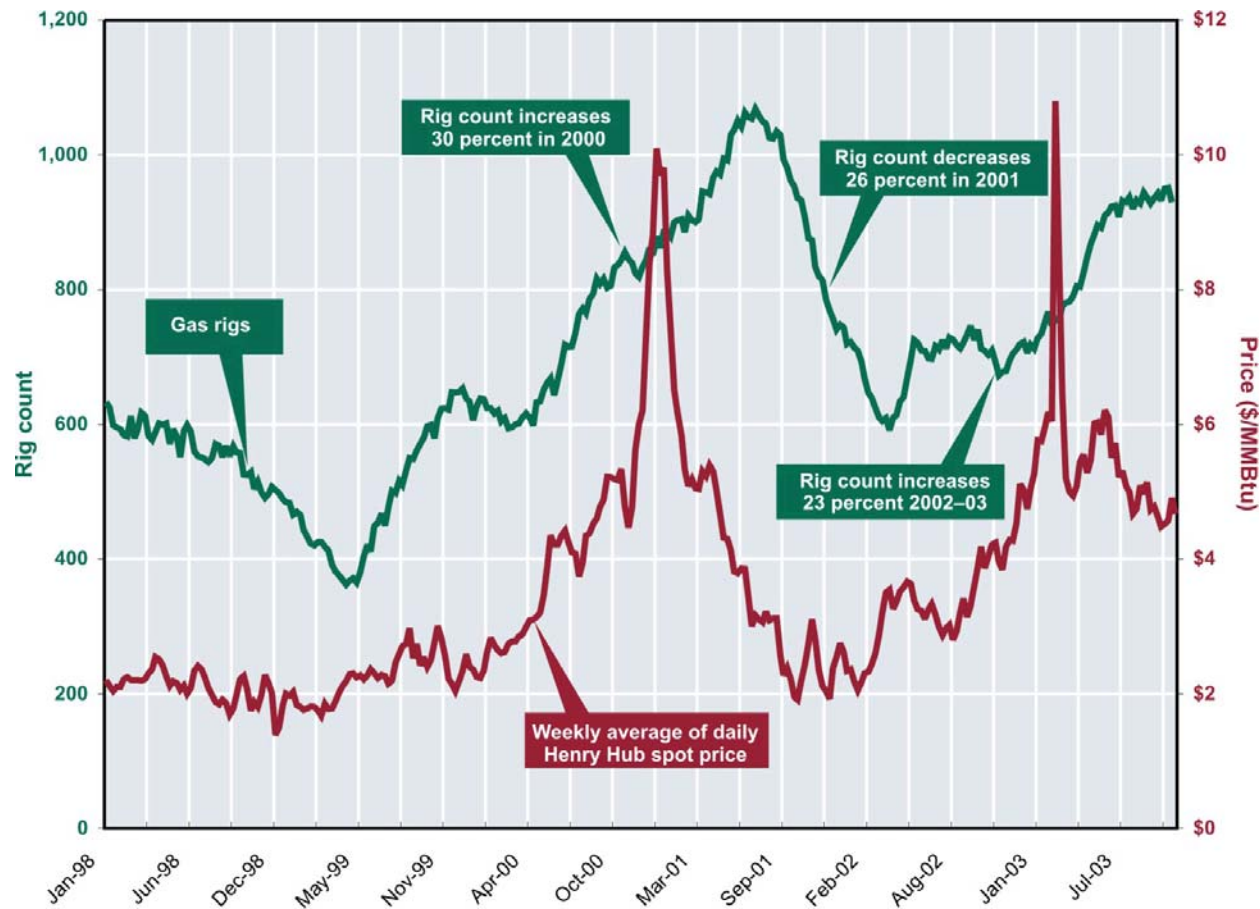
- Volumes reported to *Gas Daily* ultimately converged with volumes transacted on ICE. Note: ICE data have been modified to make them comparable to *Gas Daily* data. Since *Gas Daily* volumes include both buy and sell sides of transactions and ICE volumes include only the sell side of transactions, ICE volumes were doubled. Source: Platts *Gas Daily* and ICE.

# Forward price expectations shifted upward during 2003



Source: Platts *Gas Daily* for Nymex forward curve

## Drilling response was not robust, despite stronger price signals



Note: Prices not adjusted for inflation. Source: Platts GASdat, Platts Gas Daily and Baker-Hughes.

## **Storage investment was small and pipeline investments moderated**

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- Storage capacity increased 0.3 percent from 2001 to 2002, down from an increase of 1.4 percent the previous year.
- Pipeline investment appeared to moderate in 2003 after 3 years of annual increases.
  - 2002 \$4.3 billion (3,571 miles)
  - 2003 ~\$4.0 billion (2,911 miles)
- Investment in LNG expected to augment domestic production.

## Natural gas market performance consistent with fundamental forces of supply, demand and seasonality

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### Successes

- Products delivered on time
- Reasonable levels of investment
- Alternatives for managing risk

### Challenges

- Tight supplies
  - Severe storage volume swings
  - Deliverability constrained
  - Higher prices
  - Greater price volatility
- Thinly reported market activity
  - Credit problems
  - Decreasing volumes of trades
  - Index credibility erosion



## **Next steps for this report**

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- Development of this report has strengthened OMOI's ability to identify and analyze market structure and performance issues.
- The report will guide OMOI's allocation of resources for monitoring regions with organized markets and those without organized markets.
- OMOI will use the report as a foundation for identifying other areas for further analysis of energy markets and possible Commission action.